

THE REVIEW

DEVOTED TO THE INTERESTS OF THE AMERICAN SOCIETY FOR METALS

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Reservations of Show Space Break Records

With some 230 firms taking about 95,000 sq.ft. of exhibit space out of a possible 112,000 sq.ft. laid out, the National Metal Exposition to be held in Convention Hall and Commercial Museum, Philadelphia, the week of Oct. 20, again breaks all records in space reservations at this time of the year.

This fact, coupled with the success that other industrial shows are having in securing attendance at this time, is indicative that this National Metal Congress will be the largest and most outstanding in the history of the Society, according to W. H. Eisenman, managing director.

The usual full program of technical sessions will also feature the Congress. The program of the American Society for Metals is already well formulated and promises to reveal some new and important developments in the fields of metal fabrication and treatment.

A symposium on "Controlled Atmospheres" and two lecture courses will round out the program.

One course will consider "Heat Flow in Metals" and will be presented daily during the five days of the Congress by J. B. Austin of United States Steel Corp. Research Laboratory.

A shorter three-lecture course on "Hardness and Hardness Measurements" will be given by Prof. S. R. Williams, Department of Physics, Amherst College.

Correct Basic Mixture Important in Alloy Irons

Reported by R. E. Neils

Design Engineer, U. S. Forest Service

Oregon Chapter—A special joint meeting with the local foundrymen was held on May 26, at which V. A. Crosby, metallurgical engineer of the Climax Molybdenum Co., was the speaker of the evening.

Mr. Crosby's subject was "Modern Cast Irons", and with the use of graphs and tables, he showed the results being obtained with the addition and combination of various alloying elements.

He stressed the point that successful cast irons must have correct basic mixtures in order to get beneficial results from alloying introductions, and that smaller amounts of ferrosilicon added to the melt in the cupola, and this amount increased somewhat by addition in the ladle, improved the melt with regard to porosity, cracks and machinability.

During the discussion after the talk, a number of practical points on melting procedure were brought out.

Comstock Is Speaker at Peoria

Reported by C. A. Davis, Jr.

Caterpillar Tractor Co.

Peoria Chapter—The final meeting of the season was held on May 12, when Gregory J. Comstock addressed a deeply interested audience on subjects related to powder metallurgy.

An event of the evening was the election of officers and executive committee. These names will be published in the August issue of THE REVIEW.

Heat Treating Facilities Needed!

Members Asked to Cooperate With OPM in Collecting Names and Addresses of Firms With Idle Heat Treating Facilities

IN THE light of an increasing demand for heat treating facilities, a request comes from OPM for the collection of names and addresses of plants which have idle heat treating facilities.

A.S.M. President-Elect Bradley Stoughton is chief, Heat Treating Equipment Unit, Tools Section, Office of Production Management, Washington, D. C., and any information concerning available heat treating facilities should be sent direct to him.

He has been receiving frequent calls from representatives of plants who find it impossible to secure the added heat treating facilities they need, and state that the plants they have been dealing with are crowded way beyond their capacities. "There must be a lot of idle facilities if we could get in touch with them," says Professor Stoughton, "and I believe we would have a splendid clearing-house here if we knew where they were available."

Members of the American Society for Metals are urged to communicate with Prof. Bradley Stoughton, Room 3425 Social Security Building, Washington, D. C., if they have or know of any plant having excess heat treating facilities.

Weldability Antithesis of Hardenability, R. H. Aborn Points Out at Buffalo Meeting

Reported by Verner Linström
J. H. Williams & Co.

Buffalo Chapter—If ever there is a Society for the Prevention of Martensite, it will be started by a welder. Because, as Robert H. Aborn of the research laboratory of the United States Steel Corp. told the April meeting, "Weldability is the antithesis of hardenability; a good welding steel is a poor hardening steel, and vice versa."

The welder, who is working actually with a miniature pool of steel, is confronted by a number of problems. In producing a quality weld he must protect his work from the oxygen and nitrogen of the atmosphere. He must consider dimensional changes, shrinkage stresses and distortion, consequent to the welding process. His job is complicated by various alloys.

Biggest Trouble Is Martensite

To some extent he can shield his work from the air by adjusting his flame or covering his electrode. Stresses produced in the joint may be released in service where shock fatigue and low temperatures are not encountered; otherwise he can relieve them either by small amounts of plastic deformation as by peening in the process of welding or he can resort to annealing where severe service is expected. For special steels he has a variety of alloy filler rods at his disposal.

However, the biggest fly in the ointment is martensite. That constituent, characterized by an acicular pattern, is hard and brittle, impairing the strength (Continued on page 7)

Muncie Metallurgy Class Hears About Cold Drawing

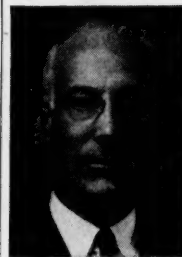
Muncie Chapter—The metallurgy class sponsored by the Chapter in collaboration with Muncie schools was addressed last month by S. W. Terry, sales manager of the Monarch Steel Co. of Indianapolis and Chicago. Mr. Terry's subject was "The Cold Drawing Process".

F. R. Morall, research engineer for the Continental Steel Co. of Kokomo, is instructor of the class, and Gene Everett is chairman of the educational committee of the Muncie Chapter.

At a regular meeting of the Chapter on May 12 Bennett Chapple, assistant to the president of American Rolling Mill Co., spoke on "Iron and Steel Sheets".

Problems of Metallurgist Are Now Changed

New Haven Chapter—Sustaining Members Night was held May 15 at Strathcona Hall, Yale University. The speaker was A.S.M. National Vice President Bradley Stoughton, director of metallurgical engineering and dean emeritus of the College of Engineering, Lehigh University, Bethlehem, Pa.



Dean Stoughton's subject was "Metallurgy and Its Place in Industry".

The metallurgist a year ago had sufficient tools to work with and his problem was to perfect more efficient alloys to perform specific tasks. His problem has now changed, for he must attempt to reach a high peak of efficiency over such obstacles as a diminished supply of metals, scarcity of certain important alloying elements, and the imposition of priorities.

Aluminum, with its vast field of national defense uses, in the aircraft industry for amphibians, tanks and light armament, has created a problem for manufacturers of such goods as kitchen utensils for they must completely rebuild their plants or divert them to other production.

Tungsten ore is found mostly in China and is therefore partially inaccessible. Molybdenum may be used as (Continued on page 5)



Compliments

To John M. Lessels and Charles W. MacGregor, both associate professors of mechanical engineering, Massachusetts Institute of Technology, on the award of the Louis E. Levy medal of the Franklin Institute for their paper on "Combined Stress Experiments on a Nickel-Chrome-Molybdenum Steel" in the *Journal of the Franklin Institute*.

Again to Charles W. MacGregor on the award of the Dudley Medal of the American Society for Testing Materials for his paper on "The Tension Test" presented at the 1940 annual meeting.

To E. W. Upham, chief metallurgist, Chrysler Corp., on his nomination as a member of the Executive Committee of the A.S.T.M.

To A. W. Sikes, assistant chemical officer of the Sixth Corps Area, Chicago, past chairman of the Chicago Chapter, on his promotion to Major, Chemical Warfare Service.

To O. W. Ellis, director of the department of engineering and metallurgy of the Ontario Research Foundation, past national trustee A.S.M., on the award of the Plummer Medal at the annual meeting of the Engineering Institute of Canada.

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Cleveland Chapter Votes \$300 for Scholarship Award at Case School

The Executive Committee of the Cleveland Chapter A.S.M. has announced the appropriation of \$300 from the Chapter treasury for the establishment of a scholarship award for the scholastic year 1941-42 at Case School of Applied Science.

This is to be applied on the tuition of a senior graduate at Case School in recognition of outstanding ability in metallurgical engineering. Leo J. Klinger has been chosen as the recipient and the announcement was made at the June Commencement.

A Scholarship Committee was appointed in the fall of 1940 consisting of Paul P. Johnson, Thompson Products, Inc., chairman; Gerald Cover, associate professor of metallurgy, and Harry Churchill, associate professor of mechanics, both at Case School of Applied Science.

This committee, in conjunction with the Executive Committee of the Chapter, felt that an award to an accomplished and deserving junior would be preferable to a scholarship given to a graduate student. The matter was therefore tabled until Doctors Cover and Churchill could select a suitable candidate.

This was done and final action taken at the spring meeting of the Executive Committee.

President Harder Is Guest At Oregon Annual Meeting

Reported by R. E. Neils

Design Engineer, U. S. Forest Service

Oregon Chapter—The annual meeting was held at the Congress Hotel on May 29 and new officers were elected.

Mr. Arthur Smith, representing Allegheny Ludlum Steel Corp., was then introduced and showed a colored movie entitled "Making of Molybdenum High Speed Steels", which portrayed the manufacture of the steel from the melting furnace to the finished product.

Chairman Healy called on Professor Graf to introduce Dr. Harder, who was the speaker of the evening. Dr. Harder's subject was "Developments in Physical Metallurgy".

He gave an interesting talk on the advancement made and the data accumulated in the last 75 years on this very important factor in the manufacture of metals. He also touched on bearing metals, powdered metallurgy and the vast field of research still remaining in alloying of the elements.

Greet President on Arrival in Los Angeles



Oscar E. Harder, President A.S.M., and His Family Were Given a Real Reception When They Arrived in Los Angeles by Southern Pacific Railway for the Western Metal Congress Last May. Here is the welcoming party greeting the Harders. Left to right are James H. Knapp, past chairman, Los Angeles Chapter; Helen Ruth Harder; Ben H. Brown, Los Angeles chairman; Mrs. Harder; Dr. Harder; Alfred G. Zima, general chairman, Western Metal Congress; and W. H. Eisenman, national secretary A.S.M.

Principles of Heat Treating Classified Under Four Headings

Reported by George S. DeArment

Asst. Plant Mgr., Champion DeArment Tool Co.

Northwestern Pennsylvania Chapter—M. A. Grossmann, director of research, Carnegie-Illinois Steel Corp., discussed "Heat Treating Principles" under four subdivisions at the meeting held May 8 in Titusville, Pa. These headings were temperature, hardenability, severity of quench, grain size.

The first aspect of heat treating, temperature, laid the foundation for the iron-carbon diagram. Experiments on steels with varying carbon contents indicate what happens when specimens are quenched from increasing temperatures, from below the critical temperature to slightly above.

The iron-carbon diagram will show what temperature is necessary to harden a piece of steel of any carbon content and the temperature at which austenite will begin to form.

In discussing hardenability, Dr. Grossmann outlined the various methods of measuring this property, the most recent and quickest of which is the end-quench test.

The third aspect of heat treating, the severity of quench, was illustrated by slides of an S.A.E. 3140 steel quenched in water and in oil.

Not only the quenching medium is a factor in hardening, but the agitation of the medium must be considered. An agitated oil quench can be more severe than a still water quench.

Grain size of a low alloy steel affects hardenability. The coarser-grained steel shows greater hardenability, and conversely small grain size reduces hardenability.

The discussion was led by J. W. Petrie, chief metallurgist for Talon, Inc., who was technical chairman. Several questions were asked concerning the iron-carbon diagram and soaking time for getting carbides into solution.

Another query concerned the effect of scale and decarburization on extent of hardening. It appears that decarburization in itself does not affect extent of hardening, whereas scale causes a decrease in severity of quench because of its insulating effect, and therefore lessens degree of hardening.

To: Chapter Officers Re: Moly High Speed

A request has come from the Office of Production Management in Washington that it should be suggested to officers of A.S.M. Chapters that they arrange to hold immediately a special meeting of their Chapter on the subject of "Heat Treatment of Molybdenum High Speed Steels".

As is now well known, all purchasers of high speed steels are required to accept 50% of their requirements in molybdenum high speed steel. Thus, beginning almost immediately, many purchasers who have been accustomed to heat treat their own tungsten high speed steels will now be required also to heat treat molybdenum high speed steels, which require different handling.

It has also been suggested that a committee be appointed from each Chapter to act as a consultant in that community on the proper handling and treatment of the molybdenum high speed steels.

Will Chapters please consider this request of the OPM.

Talk and Movie Describe Tin Plate and Containers

Reported by R. S. Crowder

Observer, Tenn. Coal, Iron & R. R. Co.

Southern Chapter—Newly elected officers were presented to the members at the sixth meeting held on May 20.

The technical program consisted of a film by Tennessee Coal, Iron and Railroad Co. on "The Manufacture of Tin Plate", as an introduction for Dr. H. S. Van Vleet, metallurgist, American Can Co. The topic of the evening was "Tin Plate and the Container Industry".

The 120 members and guests present were given a very real understanding of the problems confronting the container industry and how the manufacture of the tin plate affects the life of the tin can.

The meeting was preceded by a banquet in honor of Dr. Van Vleet which was attended by some 40 members and guests.

Attendance at West Coast Metal Show Totals Nearly 40,000

Countless new developments in alloys, fabrication and application of metals were exhibited and discussed the week of May 19 to 23, when the Fourth Western Metal Congress and Exposition was held in Los Angeles.

Attendance at the Exposition totaled 39,212—the largest of any western show yet held—while approximately 5000 were seated at the technical sessions.

Demand for metallurgical equipment in the west is at such a peak that virtually every mechanism exhibited in the Exposition was sold from the floor, and thousands of dollars worth of additional orders were written.

Technical sessions were held by the American Society for Metals, American Welding Society and American Foundrymen's Association. Nearly 50 lectures were delivered by distinguished metallurgical scientists. Many speakers gave two, three or four lectures on the same topic in order to cover all details completely.

The Board of Trustees of the A.S.M. has announced that San Francisco is being considered as the location of the next Western Metal Congress. The time will probably be the third week in April, 1943.

Talk on Magnaflux Inspection Stresses Interpretation of Test

Reported by Jack I. Medoff

Physical Metallurgist
Worthington Pump & Machinery Corp.

New York Chapter—No less an authority than Prof. A. V. de Forest of Massachusetts Institute of Technology was the technical speaker on the evening of April 14.

Speaking on "Magnaflux Inspection", Professor de Forest chose to concentrate his talk on interpretation for specifications and acceptance limits.

The speaker didn't attempt to describe any particular method or technique of operation and thus was able to cover an extremely wide range of applications.

It is especially important in times like the present, when conservation of materials and skilled labor is desirable, not to be over-critical when not absolutely necessary.

It is essential to differentiate as to whether or not the magnetic indication affects the strength—and if any doubt exists, no decision should be made without further inspection.

This is even true of cast aluminum aircraft parts. Last year, a large quantity of parts were rejected on inspection only—parts which had never failed in service and which, in subsequent satisfactory mechanical tests, proved the rejections to have been unjustified.

In the same way it would be wrong to reject wrought iron and screw stock, on magnaflux inspection, for their inclusions and stringers, without first considering the strength relationship.

The speaker illustrated an ingenious transference method of reproducing for record or demonstration the appearance of the defect, by pressing a strip of scotch cellulose tape onto the magnetized "mud" pattern, then stripping and mounting it onto a card or sheet of paper.

An absorbing and extremely interesting coffee talk was presented by Dr. V. K. Zworykin of the R.C.A. Research Laboratories on the "Electron Microscope".

It was amazing to learn of the decided similarity of the electrostatic lens to the glass lens.

Six Chapters Assemble for All-Day Session

Reported by Walter M. Saunders, Jr.
Consulting Chemist and Metallurgist

The eighth annual New England Regional Meeting was held on May 23 in Providence, with the Rhode Island Chapter as host.

In spite of current business conditions and a very hot day, a worthwhile attendance of 250 was recorded, with all visiting chapters, namely, Boston, Hartford, Worcester, New Haven, and Springfield, well represented.

In chronological order, the morning was devoted to plant trips, the afternoon to a technical session, and the evening to dinner and sociability.

Starting at 9 a.m., several busses carried members and guests to either the modern coke plant of the Providence Gas Co., or to the Gorham Mfg. Co., manufacturers of silverware since 1851, where guides conducted the parties on inspection tours.

Technical Session Follows Plant Trips

After lunch, with the weather becoming hotter by leaps and bounds, the technical session was held at the Narragansett Hotel. Breaking all precedents, comfort became the paramount consideration, and coats and vests, and in some cases ties, were quickly discarded.

Interest in the three papers presented was so sustained that there was practically no coming and going of listeners. First on the program, Col. Scott B. Ritchie, Watertown Arsenal, talked on "High Speed Steel in National Defense".

Colonel Ritchie likened the present world war to a conflict between metal industries, and stressed the extreme importance of providing proper tools for continued production for defense.

Professor Morris Cohen of Massachusetts Institute of Technology then described "New Ideas on the Heat Treatment of High Speed Steel", devoting his remarks to what happens when high speed steel of the 18-4-1 type is tempered. The advantages of multiple tempering appear to be of great importance, and it is understood that he will soon present to the A.S.M. a summary of his recent results, which are a continuance of the spectacular ones given last fall at the Cleveland Convention.

Schlegel Talks on Atmospheres

Last, but not least on the program, Walter A. Schlegel, Carpenter Steel Co., spoke on "New Developments in Atmospheric Control in the Hardening of High Speed Steel".

Mr. Schlegel confined his talk to what happens on the surface. He showed a carbon pick-up when an atmosphere high in carbon dioxide is used, and brought along many excellent slides to illustrate the structures obtained at the surface of high speed steels with atmospheres of varying compositions.

The dinner followed the usual pattern of good food, good fun, and plenty of singing, with introductions of visiting chairmen, and the committee responsible for the affair.

They were—Eugene J. Sullivan, George E. Gregson, Carl G. Peterson, Allan G. Shepherd, Jr., Clarence P. Bearce, and M. W. (Doc) Rigdon.

Representatives from the Providence Gas Co. and Gorham Mfg. Co. were thanked for their cooperation in conducting plant visits.

As the principal speaker, J. H. Van Deventer, editor of *The Iron Age*, gave an address on "Tomorrow's Challenge to the Technician".

Random Shots of New Englanders at Joint Meeting



Shirt Sleeves and Cooling Drinks Became the Order of the Day at the New England Regional Meeting Held in Providence, Rhode Island, on May 23. Photographs by H. H. Harris, president, General Alloys Co., Boston.

Every Failure in Tool Steel Is Result Of Stress Says Stagg

Reported by James C. Erickson
Deere & Co.

Tri-City Chapter—Howard J. Stagg, sales metallurgist, Tool Steel Division, Crucible Steel Co. of America, addressed the May meeting with an excellent talk entitled "Tool Steels". The meeting was held at the Hotel Fort Armstrong, Rock Island, Ill.

Every failure everywhere is the result of stress. The cause of every failure of metallic parts is, first, the metallurgist, second, the designer, and last, the fabricator—that is assuming that the metallurgist's choice of material is correct and the designer's design is satisfactory.

Occasionally a designer or a metallurgist attempts to increase stiffness by increasing strength, thus often resulting in misuse of materials. The speaker pointed out that instead of choosing stronger material to increase stiffness, the points of support or the size of the material should be increased.

The speaker stressed the necessity for a knowledge of the S-curves to heat treat tool steels properly. Many times tool steels fracture when heat treated simply because they are not allowed to cool enough before drawing.

It should always be remembered by the heat treater that his tool should be at "handling temperature" before drawing; otherwise 10 to 20% of the austenite may remain untransformed.

This untransformed austenite when cooled from the draw temperature will transform into untempered martensite. In this way stresses may be built up, causing strain which in turn causes the part to burst. The result is failure.

Industry Rapidly Increasing Production Of Army Equipment, Says Ordnance Chief

Reported by H. D. McCarty
Baltimore Tool Works

Baltimore Chapter—At the final meeting of the year on May 19, Major W. S. Broberg, chief of industrial service, Philadelphia Ordnance District, presented a talk on the relations of the Ordnance Department with the industrial firms. Let it be said that, even though humor was interspersed, the seriousness of the talk rang home to every member and guest present.

However, it also engendered a feeling of optimism with regard to our program of National Defense. Never again will the American soldier fight with another nation's equipment as he did in 1917.

Through experiences gained in the

last war, the Ordnance Department can promise the infantryman that he will fight with his own automatic weapons, and the artilleryman that he will have his own 105's and 155's which will represent the close coordination of the six manufacturing arsenals with the industrial plants of the United States.

This change has not come about in the past two years but has been carefully planned during the past 17 years. The culmination of that planning work is now being realized.

Ordnance requirements are sent out by the Ordnance Office in Washington to the fourteen procurement officers in the field. These officers now negotiate, administer and inspect the contracts which they place with civilian plants.

Major Broberg pointed out that inasmuch as civilian manufacturers now understand the exacting requirements the Ordnance Department desires, their production has increased by leaps and bounds, and it is well ahead of schedule.

In other words, it may be said that in a few months' time the public will see some real mass production of Army equipment, such as rifles, machine guns, artillery, tanks and other motorized equipment.

It was a pleasure to have Major Broberg, and the Chapter was disappointed that he could not remain for the discussion.

New Jersey A.S.M. Member Dies

WILLIAM P. HARTSHORNE, aged 72 years, died at his home in Newark, N. J., of a heart attack on May 24. A member of the New Jersey Chapter of the A.S.M., he had been associated with Peter A. Frasse and Co. in a sales capacity for the past 19 years.

Lehigh Valley Chapter Has Annual Dinner Dance

Reported by Robert D. Stout
Department of Metallurgy, Lehigh University

Lehigh Valley Chapter—On Saturday, May 3, the annual dinner dance was held at the Hotel Traylor in Allentown.

Although the occasion is purposely kept free of speeches, a highlight of the dinner was the induction of H. L. Fry as the Chapter chairman for 1941-42, succeeding G. E. Brumbach.

As a token of the Chapter's appreciation of his services during the past year, Mr. Brumbach was presented with a cigarette lighter-holder.

About 150 people attended this final meeting of the year, which is the one opportunity the ladies are given to accompany their husbands to an A.S.M. meeting.

Air Engine Life Was 50 Hr. in 1917, Is Now 5000 Metallography Has Place in Shop Practice

Improved Metallurgical Design Includes Many Factors Besides New Alloys

Reported by Fred P. Peters
Assistant Editor, Metals and Alloys

New Jersey Chapter—American aircraft engines now regularly run 500 to 600 hr. between overhauls, with a life up to 5000 hr. Compare this with the breath-held 50 hr. that was considered good in 1917 and you have a rough idea of what ever-improving metallurgical design has meant to this country's security.

Many of the metallurgical developments that have aided so much in boosting the power, safety and durability of aircraft engines were explained to over 200 members and guests at the Essex House, Newark, by B. Clements, metallurgist of Wright Aeronautical Corp., on May 19.

Aluminum Dominates Engine

The story isn't entirely one of new alloys—it includes better knowledge of existing materials, improved processing factors and the solution of a host of obstinate problems. The aluminum alloys as a class still dominate the aircraft engine but they are giving ground to magnesium alloys. More steel is going into aircraft, too, with the expected changeover headaches.

The speaker discussed these headaches and offered many other practical pointers of generalizable application. Thus, he favors over-aging aluminum alloy (5% Si) castings because of the assurance of complete stress relief so provided.

Also, difficulty in obtaining sound castings in aluminum alloy can be circumvented by designing stressed parts as forgings, which have a sounder, safer structure. The largest aluminum alloy forging is the crankcase.

Heat Treating Practice

On the other hand, many crankcases are now made of steel, and are actually lighter than those of aluminum as well as more fatigue-resistant.

Gears are usually carburized, although larger gears are nitrided to limit distortion. Surfaces not required

to be hard should not be nitrided; tin coatings should be used to "stop-off" surfaces that can be left soft.

Trouble in treating carburized S.A.E. 3312 gears can usually be licked by controlling the carbon in the case (keeping it low), and then quenching from a high enough temperature to put all the carbon in solution.

Hardness May Be Sacrificed

In fact, Mr. Clements attributed many of the ailments of treated steel parts to a general "infatuation" with unnecessarily high hardnesses. The best practice from the all-round service viewpoint may be to use more alloys, quench from a temperature that gives a hardness near that desired, and then draw at relatively high temperatures, sacrificing some hardness in favor of adequate stress-relief.

Cadmium coatings as an aid to mag-nafixing, copper plating as a carburizing stop-off, chromium-plate for hard surfaces and tin stop-offs for nitriding were mentioned. One new trend is the use of metal-sprayed aluminum coatings in place of paint, which was never entirely satisfactory because it heat-sealed and rusted in maritime service.

An "associate feature" on the evening's program was an unusually interesting motion picture, "Aircraft Engine Manufacture", showing the carefully controlled metal processing and as-

Bowling Ends N.W. Season

Reported by C. A. Nagler
Instructor, University of Minnesota

North West Chapter—The 22nd annual meeting was held at Kipp's Buckhorn Lodge, Long Lake, Minn., on May 26. Toastmaster at the steak dinner was Ralph L. Dowdell, professor of metallography, University of Minnesota. At the close of the dinner officers were elected and pictures of hunting and fishing were shown.

The dinner meeting was adjourned to the bowling alley at the Lodge and a tournament was held for a \$10 first prize and a \$5 second prize.

This meeting was the last of the 1940-41 season and closed a very successful year for the Chapter.

sembly operations carried out in making Wright engines. H. E. Linsley, of Wright's production engineering department, provided the running-script comment for the picture in unusually "professional" fashion.

Strategic Metals Are Classified, Discussed By Air Corps Major

Reported by James W. Poynter

Asst. Met., Army Air Corps, Wright Field

Dayton Chapter—The timely subject "Strategic Metals and Their Supply" was discussed by Major George C. Crom, Jr., of the Industrial War Plans Section, U. S. Army Air Corps, at the meeting on May 14.

Metals are classified as strategic, critical, or essential according to the degree of need in time of war. The strategic metals, chromium, manganese (ferromanganese grade), nickel, tin, tungsten, antimony and mercury, are those metals whose uses must be rigidly controlled because of a decreased supply or a greater demand.

The critical metals, aluminum, platinum, iridium, palladium, osmium, vanadium, and manganese, are those of which a better supply is available or the increase in demand less and consequently whose use need not be so rigidly controlled.

The essential metals, defined as those for which there is no procurement problem in time of war, at present are iron and steel, lead, beryllium, cobalt, cadmium, molybdenum, titanium, uranium, and zirconium.

Possible substitutes for the metals on these lists and effects of higher prices in promoting increased domestic production were discussed. Numerous questions were answered by Major Crom at the conclusion of his talk.

At the dinner before the talk, the officers for 1941-1942 were installed and a picture "On to Jupiter" shown. In this picture, presented by General Motors, two members of the Dayton Chapter, F. V. Lenel and S. R. Prance, appear.

Reported by George S. DeArment

Asst. Plant Mgr., Champion DeArment Tool Co.

Northwestern Pennsylvania Chapter—Credit for the success of the April meeting—the largest ever held by this Chapter—was due to the work of the National Forge and Ordnance Co. group who had charge of the arrangements.

Immediately following the dinner a sound film entitled "Designing of Steel Castings" was presented by R. M. Spencer of the National Forge and Ordnance Co.

The speaker of the evening, Mr. O. W. McMullan, metallurgist for the Youngstown Sheet and Tube Co. of East Chicago, Ind., opened his talk on "Fundamentals of Metallography in Shop Practice" by giving his definition for metallography.

Metallography Defined

Metallography is the study and microscopic analysis of structures in steel. It is the tool by which metallurgists can determine a structure, a condition of heat treatment, or whether working has occurred.

At the same time, such simple tests as fracture tests, acid tests, and file tests are informative and require no special knowledge of metallurgy and should not be forgotten.

Mr. McMullan devoted the rest of his lecture to showing and explaining slides. He stressed the importance of good distribution of constituents on properties.

The first group of slides showed inclusions of different types, including oxides, sulphides, and silicates found in castings and rolled steel. Several slides revealed how these inclusions are elongated when the steel in which they are embedded is rolled.

Slides Show Structures

The next group of slides depicted the effect of increasing the carbon content of steel. These photomicrographs showed increasing amounts of pearlite and a decreasing amount of free ferrite, and finally in the 1.15% carbon steel an excess of cementite on the grain boundaries.

The next group showed the dendritic structure commonly found in iron and steel as cast.

The effect of hot work was depicted by a photomicrograph of a forged structure which showed the fine grain characteristics. Another steel given a high draw at 1275° F. showed the relieving of the sharp-cornered grains and needles of the undrawn structure.

Defects and Failures Illustrated

The effect of cold work was exemplified by a photomicrograph with elongated grains.

The last group of photomicrographs was entirely devoted to defects and failures in steels. Included were slides of a seam, a lap or cold shut as found in forging, a quenching crack or crack, an example of burnt steel, a corrosion fatigue failure, an example of incomplete annealing, an overheated high speed steel and the effect caused by a cut-off saw or torch cut when the critical temperature was exceeded.

WANTED

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A series of five educational lectures on the selection, properties and uses of commercial tool steels. The book is divided into five chapters under the following titles: Manufacture, classification and selection of tool steels... evaluation and testing; effect of alloying elements... carbon and low alloy tool steels... tool steels of intermediate alloy content... high carbon, high chromium steels and high speed steels.

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7301 Euclid Ave.

AMERICAN SOCIETY FOR METALS

Cleveland, Ohio

Hoyt's Informal Talk Covers Many Subjects

Reported by Walter G. Patton
Engineer, Climax Molybdenum Co.

Detroit Chapter—The members learned many things from Sam Hoyt at the May meeting, but the quip that will stick longest with many of his more than 200 listeners was the speaker's definition of a metallurgist. According to him, most people think that a metallurgist is just a "blacksmith with a college yell".

During the course of his pleasingly informal talk, Mr. Hoyt commented on a diversity of subjects, including research, the behavior of steel under stress, impact tests, and notch effect. Fundamental and applied research were clearly defined and he directed particular attention to the intermediate field which is too often neglected.

The development of the microscope (by Zeiss), Jena glass, and the practical application by General Electric of the alternating current theory developed by Steinmetz were cited as typical contributions of this type to scientific progress.

Shear and Torsion Theory Discussed

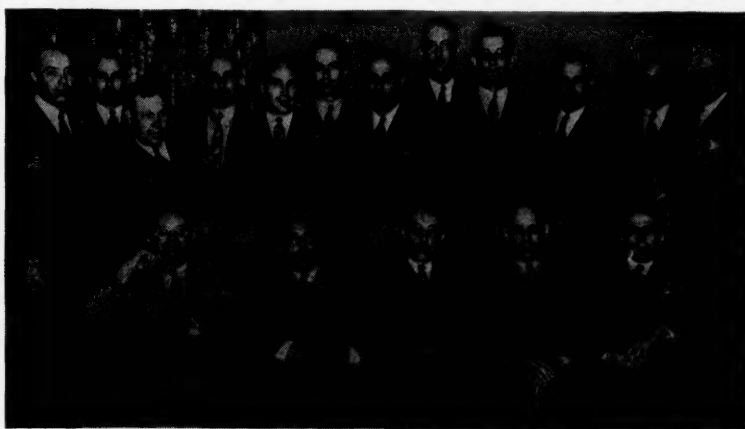
Mr. Hoyt spent considerable time discussing the theoretical aspects of the behavior of metal in shear and torsion, pointing out that engineers' conception of such things is too often over-simplified. He emphasized the fact that theories which hold for commercial metals with randomly oriented grains may be shown to be invalid by work on single crystals.

As an example, the shear-strain-energy theory that applies (fortuitously) to ductile steel may not hold for hard, brittle cast iron. Yet it is important that such things shall some day be known exactly for aircraft construction and for weight-saving design.

The speaker told of some of his experiences in the World War I era when he found some reputable industrial plants relying wholly on the human eye rather than on pyrometers. Fatigue tests, it seems, were actually investigated at that time and abandoned for the reason that the surface of the specimens had to be polished to get check values!

The question of impact testing and notched bar testing was raised and the speaker gave it as his considered opinion that our present Izod and Charpy tests are notched bar tests rather than a method of measuring resistance to impact. In fact the notch actually in-

Golf and Election Feature Annual Meeting



New Officers of the Cincinnati Chapter Are SEATED, Left to Right: Stanton Olinger, Treasurer; M. H. Brumble, Past Chairman; George H. Gerdes, Chairman; William Ball, Jr., Vice-Chairman; Charles P. DeVore, Secretary. STANDING, left to right, are the members of the Executive Committee: Mario Martellotti, H. E. Montgomery, W. W. Baker, W. A. Maddox, A. P. Fischer, A. J. Smith, Walter Petry, W. N. Hedeman, B. W. Small, C. J. Robinson, S. F. Levy and Kurt Siems.

Cincinnati Outing Is Held at Kenwood Country Club May 9

Reported by Kurt Siems

Sales Engineer, Cincinnati Milling Machine Co.
Cincinnati Chapter—The annual meeting was held May 9 and started with an afternoon of golf at the Kenwood Country Club.

After an excellent buffet dinner and with the help of a musical trio and some good old Cincinnati beer, the evening progressed quite satisfactorily.

The only business attended to was the reading of the various reports of the outgoing officials and the election of the new officers.

validates the test as an impact test.

He also pointed out that after making fatigue tests of rear axle gears, Boegehold concluded that the shape and surface of the gear teeth, distortion, and internal stress were all more important than the type of steel used. This could not be true if the low temperature notch sensitivity had been a factor and in this way he showed that Boegehold's results do not conflict with Riegel's, as has been assumed.

Mr. Hoyt suggested that the problem of notch sensitivity, both in impact and fatigue loading, is very much in need of systematic study.

Glenn Coley served as technical chairman. A moving picture, "Wheels Across India", was shown immediately after dinner.

Plastics, Styled "Glamour" Materials of Engineering, Have Thousands of Variations

Reported by Forrest R. Nagley
Associate Engineer, Navy Department

Washington Chapter—A. Allan Bates of the Westinghouse Electric & Mfg. Co. introduced "Plastics" as the "glamour" materials in engineering. The present interest in plastics has become so keen among engineers not only because the available commodities manufactured from plastics are colored and somewhat ornamental, but because in certain applications plastic materials are rapidly replacing metals.

Dr. Bates introduced his remarks with a demonstration of the chemical reaction between phenol and formaldehyde in the presence of sodium hydroxide. With the "phenolic" thus produced, it was explained that analogous substances by the thousands could be produced by varying the compounds enter-

ing into the condensation reaction, the non-reacting substances contained in the reaction mixture, and the conditions under which the reaction takes place.

With such a multiplicity of possibilities it becomes imperative for materials engineers to understand the various classifications of plastics. They are either "thermo-plastic" or "thermo-setting".

Each of these classes may be either "filled" or "unfilled". Filled plastics may be either "molded" or "laminated". Unfilled plastic forms may be cast, extruded, or drawn.

Several specimens of the "filled" plastics were exhibited which represented commercial applications: gear wheels, tubular goods, and "ply wood".

The talk was supplemented with several lantern slides illustrating many engineering applications of plastics.

New Problems In Corrosion Are Outlined

Reported by Joseph Missimer
Salesman, L. Norris Hall, Inc.

Philadelphia Chapter—A large group at the last regular technical meeting on April 25 was entertained after dinner by Rudy Saxon, prestidigitator par excellence. Mr. Saxon's most skillful hands performed a number of astounding tricks, and his feats as a memory expert were redoubtable.

The Tellers Committee reported the returns of next year's officers, and the technical meeting was turned over to Ralph W. Leiter, chairman of the Program Committee, who introduced R. M. Burns. Dr. Burns, who is assistant chemical director of the Bell Telephone Laboratories, spoke on corrosion.

Corrosion costs the country several hundred million dollars annually, and while this is an appallingly large figure it is but a small percentage of the value of the metallic materials in use.

150 Million Gal. of Paint Used

The need for corrosion prevention has given rise to the development of the metal coating and paint industries, with 150 million gallons of paint used annually to protect ferrous metals. Metallic coatings account for 50% of the zinc, 40% of the tin, and 10% of the nickel consumption.

The national defense effort has given rise to new problems in the protection of military equipment, and the increased requirements for certain metals have made necessary the development of substitute finishes for certain civilian needs.

The mechanism of corrosion was outlined and it was shown that all corrosion reactions are electrolytic in character. Corrosion may be prevented by maintaining the environment in which metals are used not corrosive in character.

More generally, however, corrosion is prevented by interposing a protective film between the metal surface and the surrounding environment. These protective films may be formed naturally as superficial corrosion products on the metal surface or they may be applied as metallic or paint coatings.

Chemical conversion coatings, produced by treatment with phosphates or chromates, and anodic oxidation coatings were described.

Coatings for Mg Described

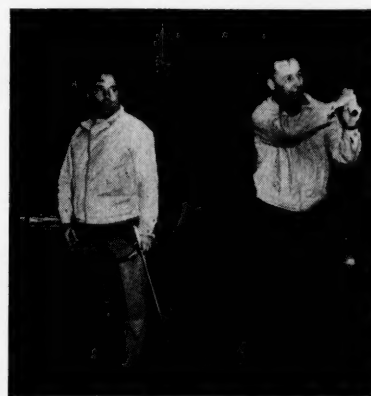
Successful coatings for the protection of magnesium alloys now widely used in aircraft consist in chromate dipping followed by a primer coat of paint pigmented with zinc chromate and a top coat employing a synthetic resin vehicle. Recent developments in zinc, nickel and tin coatings were described.

As a means of conserving nickel it is becoming common practice to replace from a half to three quarters of the thickness of nickel coatings with copper, using sufficient layer of nickel and chromium on top to prevent the appearance of copper tarnish products on the surface.

latter of which will be highly competitive. These fields would be insufficient to keep our present plants operating efficiently.

In closing, Dean Stoughton pleaded for unselfishness on the part of the people, industry and the nation as a whole so that the emergency measures may be successfully carried out.

The lecture was preceded by a dinner held at the Taft Hotel. Officials of the Chapter sustaining members were introduced and placards were presented to the new members.



Archery Enthusiast M. H. Brumble Challenged Walter Petry to a Golf and a Bow and Arrow Match at the Annual Meeting. Although Mr. Petry was allowed a handicap of two balls, Mr. Brumble won the match with 65 shots.

Problems Facing the Metallurgist Now Changed—Stoughton

(Continued from page 1)

a substitute for this metal in tool steels and projectile points.

Nickel, zinc and possibly tin all have their place in the changing structure of the metals industry.

Silicon and glass will be used as an important substitute for tin. The process of reclaiming tin from cans, although practical in Germany, cannot be used here because of the high cost of labor.

Zinc must be diverted from such uses as galvanizing and directed more toward the brass industry.

Post-War Situation Predicted

Perhaps the most interesting part of Dean Stoughton's talk was his predictions as to the post-war international economic situation. Citing the steel industry as an index, he showed where the future of our steel mills might be considered rather bleak.

Japan with its tremendous reserve of scrap iron, obtained mostly from the United States, its vast supply of ore in Manchukuo, and its recently completed manufacturing plants will dominate the East.

Germany with the combined productive capacities of all Central Europe will equal our own output and will have a closed market over there.

England, never a large consumer of our goods, has increased her production threefold and therefore will be producing more than enough for herself.

The American mills will have, as their only outlet, home consumption and possibly the South American countries, the

Helpful Literature — Mail Coupon Below

Special Steels

An attractive, helpful 124-page handbook containing the properties, uses, and fabricators of stainless, electrical, carbon and other steel manufactured by the Allegheny Ludlum Steel Corp. is available. Bulletin De-92.

High Speed Steel

A new 12-page booklet which describes Jessop's Mogul molybdenum-tungsten high speed steel has just been published by the Jessop Steel Co. Bulletin De-173.

Aluminum Castings

An aluminum casting alloy is announced by the National Bronze and Aluminum Foundry Co. of Cleveland. Known as the T-1 aluminum alloy, it has a tensile strength up to 33,000 psi. without heat treatment. A folder gives complete data, composition and detailed information. Bulletin De-307.

Degreaser

Degreasing machines for practically every cleaning job are described in literature made available through the Detroit Rex Products Co. Bulletin Hc-111.

Rotary Files and Burs

A variety of high-speed Rotary Files and Burs plus other necessary shop equipment is included in the complete catalog available through the Martindale Electric Co. Bulletin Kd-282.

Metal Blackout

The JETAL process for blackening iron and steel quickly and thoroughly at low cost is described in literature available through the Alrose Chemical Co. Bulletin Cd-256.

Heat and Corrosion

A catalog showing various uses of Fabrite to resist heat and corrosion has been prepared by the Ohio Steel Foundry Co. Bulletin Kd-40.

Refinery Alloys

Special alloys for refineries, corrosion, temperature, and abrasion resisting are covered in a colorful folder produced by the Duraloy Co. Bulletin Kd-233.

High Temperature

High temperature uses of Monel, Nickel and Inconel are analyzed and pictured in a recently printed bulletin released by International Nickel Co. Bulletin Kd-45.

Mechanical Oscillator

The Bernhard Mechanical Oscillator, which makes possible dynamic tests using artificial vibrations on units varying in size from a small specimen to a full size structure, is explained in an 8-page booklet by the Baldwin-Southwark Div., Baldwin Locomotive Wks. Bulletin Ce-67.

Measuring Metal Coatings

Measurements of local thicknesses of coatings on metals may be made in less than one minute by the Magne-Gage, an interesting instrument described in a 4-page folder by the American Instrument Co. Bulletin Cd-259.

Portable Brinell

Brinell hardness of metal can be obtained quickly anywhere—without dismantling and without transporting specimens to the laboratory—by a portable Brinell tester described in a folder by Teleweld, Inc. Bulletin Hd-98.

Universal Testing

A low-priced Universal Hydraulic Testing Machine for tension, transverse, compression and Brinell hardness tests is described in a pamphlet by Riehle Testing Machine Div. of American Machine & Metals, Inc. Bulletin Fc-157.

Rapid Oil Cooler

A leaflet by Bell and Gossett shows the importance of keeping the oil quenching bath at a constant temperature in the heat treatment of metals, and describes the new B & G Oil-Cooler. Bulletin Kd-287.

Heat Treat Containers

Over 300 available patterns of carburizing, annealing and other heat treating containers are listed in a Data Book made available by the Michiana Products Co. Bulletin Ce-81.

Heat Treating

A folder by Industrial Heating Equipment Co. explains and illustrates diagrammatically a continuous type heat treating furnace in which temperature can be held to within extremely close limits, and in which the product is always uniformly heated. Bulletin Ga-168.

"Sel-Car"

A coating which gives surface protection of steels susceptible to decarburization during heat treatment and permits selective hardening is manufactured under the name "Sel-Car" by the National Copper Paint Corp. Bulletin De-306.

Motor Blower

Blowers used for oil and gas burning are featured in an interesting booklet by Ingersoll-Rand. Bulletin Kd-222.

Cutting Oil

An informative booklet containing 48 pages of scientific applications for the largest selling sulphurized cutting oil is offered by D. A. Stuart Oil Co., Ltd. Bulletin Kd-118.

Oil Burners

North American Mfg. Co. offers a bulletin describing improved low pressure oil burners, one type especially designed for automatic control and ideally suited for use with proportioning control valves. Bulletin Na-138.

J-M Industrial Products

The new 1941 52-page illustrated edition of the Johns-Manville Industrial Products catalog is now available, covering information and recommendations on high and low temperature insulations for many industrial needs. Bulletin De-100.

Super Refractories

A very handsome spiral-bound 76-page catalog covering their extensive line of refractories for heavy duty service is offered by the Carborundum Co. Bulletin Ld-57.

Electric Furnaces

Economy . . . ruggedness . . . speed . . . and versatility distinguish the line of electric furnaces described in a bulletin by The Detroit Electric Furnace Division, Kuhlman Electric Co. Bulletin Hd-271.

Industrial Furnaces

A series of interesting bulletins showing Dempsey Industrial Furnaces in a wide range of requirements is available through the Dempsey Industrial Furnace Corp. Bulletin Dd-260.

Welding Stainless

How to weld stainless steels is described in a colorful 12-page folder released by the Page Steel and Wire Division of American Chain & Cable Co., Inc. Bulletin Ce-86.

Nonferrous Data

Valuable reference material is contained in an 18-page booklet released by Rye Copper & Brass, Inc., containing practical and complete tables of weights and Data on Copper, Brass and Bronze products. Bulletin Be-239.

Manganese Steel

A 64-page book on the history, production and uses of Manganese Steel, with 400 pictures, is available through the American Manganese Steel Division, American Brake Shoe & Fdry. Co. Bulletin Hd-9.

Rustless Handbook

Offered as an answer to the question, "Which stainless steel?" a 60-page handbook by Rustless Iron and Steel Corp. gives complete information on properties, processing, and engineering applications of a wide variety of rustless and stainless steels. Excellently arranged and printed. Bulletin Bb-169.

Die Steels

For applications where toughness and the ability to withstand wear is essential, the G.S.N. Die Steels described in Latrobe Electric Steel Company's booklet fill the bill. Bulletin Ld-208.

High Speed Hardening

High quality from unseasoned labor is one of the reasons why men confronted with steel hardening problems will be interested in a new method developed by The Sentry Co. and explained in their folder. Bulletin Ee-114.

Industrial Baskets

A handbook for shop executives and purchasing agents showing 50 types of construction and design of welded industrial baskets has been printed by Rolock, Inc. Bulletin Ae-299.

Park-Kase

A leaflet by Park Chemical Co. contains complete information concerning a liquid carburizer of rapid and uniform penetration. Unique features and advantages of the bath are backed up with technical data. Bulletin Na-141.

Brazing Alloys

How you can put your metal joining on a sound, economical basis is explained in a folder just released by Handy & Harman. Well illustrated and full of facts. Bulletin Ic-126.

Contour Machine

An unusual file-size spiral bound book containing a wealth of information on contour cutting is offered by Continental Machines, Inc. Bulletin Ee-170.

Refinery Alloys

Special alloys for refineries, corrosion, temperature, and abrasion resisting are covered in a colorful folder produced by the Duraloy Co. Bulletin Kd-233.

Cutting Oils

An interesting new booklet, "Metal Cutting Lubrication—In Theory and Practice", has just been made available by Cities Service Oil Co. Bulletin Ec-113.

Band Saws

Actual performance records for DoALL Band Saws are contained in a booklet made available by the DoALL Co., Inc. Bulletin Ae-297.

Condensed Catalog

A new condensed catalog covering most of their control instruments in a comprehensive manner has been made available by Wheelco Instruments Co. Bulletin Ee-110.

Laboratory Appliances

A line of laboratory appliances whose resistance to corrosion by laboratory fumes insures a long, useful life and attractive appearance is described in a colorful folder released by the Burrell Technical Supply Co. Bulletin De-213.

Modern Polishing

Just off the press by Tracy C. Jarrett is a new booklet describing a simplified and improved technique which enables even inexperienced operators to turn out large quantities of polished specimens. Bulletin De-303.

Cr-Ni-Mo Steels

A Finkl & Son's catalog is really a technical treatise on chromium-nickel-molybdenum steels for forgings. Pocket size, 104 pages, cloth bound, illustrated by photographs, charts and tables. Bulletin La-23.

Meehanite Castings

An interesting, well-illustrated 49-page booklet, "Meehanite in Industry", covering applications of Meehanite castings in a variety of industries is now available through the Meehanite Research Institute of America, Inc. Bulletin Ce-165.

Annealing Furnace

The interesting "Top Hat" Cover Annealing furnace perfected by Continental Industrial Engineers, Inc., is described in a bulletin of value to furnace users. Bulletin Nc-154.

Electric Furnaces

A four-page bulletin on 1/4 lb. to 4 lb. high frequency melting furnaces and 3 kw. converter is now available through the Ajax Electrothermic Corp. Bulletin Dd-41.

Open-Hearth Bottoms

A practical way to save time with safety by resurfacing open-hearth bottoms regularly with a quick-setting magnesite refractory is explained in an attractive folder released by Basic Refractories, Inc. Bulletin Ee-192.

Furnaces—Ovens

Forced convection heat treating with recirculation is the principle which distinguishes the line of furnaces and ovens for heating, drawing, annealing manufactured by the Morrison Engineering Corp. Bulletin De-305.

Core Making, Baking

A very striking new 14-page folder released by the Despatch Oven Co. will be helpful to those engaged in core making and baking because it explains fundamentals of good core making and shows better ways of handling cores. Bulletin Ee-123.

Steel Data

Ten colorful leaflets, each describing a popular grade of tool or high speed steel and giving useful data, application information, etc., have just been issued by Vanadium-Alloys Steel Co. Write for Bulletin Kd-294.

Free Machining

Reserve your copy of new twenty-page story of Speed Case and Speed Treat. This booklet covers physical properties, compares this W. J. Holliday & Co. steel with SAE 1020 and others. Explains how manganese and sulphur content plus patent manufacturing processes produce free machining combined with comparatively high physical values. Also contains machinability carburizing tables and pictures applications. Bulletin Kd-293.

Rocker Barrels

The operation of cleaning miscellaneous items of gray iron, steel, semi-steel malleables, forgings, plates, bars, bronze and other castings by the Airless Rotoblast method is described fully in a handsome booklet by the Pangborn Corp. Bulletin Ae-68.

Carbide Tools

"Firth General Purpose Tools" is the title of a new bulletin and price list available from Firth-Sterling Steel Co. Bulletin Ae-177.

New Cleaning Process

A new process for cleaning brass, copper and zinc alloys before plating to provide better removal of oil, grease, smutty deposits and soap films to assure better plate adhesion is described in Oakite News Service, house magazine of Oakite Products, Inc. Bulletin De-296.

Refractory Cement

An economical silicon carbide cement for general service in furnace linings is described in a colorful folder released by the Norton Co. Bulletin Be-88.

Furnace Catalog

A 120-page catalog covering the complete line of furnaces and burners manufactured by The American Gas Furnace Co. is available to companies who request this book through THE REVIEW on their company letterhead. Bulletin Be-11.

Convection Furnaces

Batch type SC Convection Furnaces which pay for themselves in seven months are explained and illustrated in a new folder by Surface Combustion Corp. Bulletin Ge-51.

Thermocouple Head

Thermocouple heads and parts are covered in literature by Claud S. Gordon Co. Bulletin Be-53.

Hard Facing Alloys

For maximum resistance to wear and corrosion, the Wall-Colmonoy Corp. offers a fact-packed folder which is extremely helpful to anyone having this problem. Bulletin Kd-85.

Welding Alloys

New low temperature welding alloys which bind by eutectic low temperature reaction to give stronger joints are described in literature available through Eutectic Welding Alloys, Inc. Bulletin Be-301.

Cecostamp

A high production, impact-type stamping machine developed for forming stainless steel, thin hot work that cools quickly, embossing, and work hard to set to final shape is described in an instructive 16-page booklet by the Chambersburg Engineering Co. Bulletin Gc-132.

Quenching Handbook

Quenching oils for every required speed, every need are described in the valuable new Quenching Handbook printed by E. F. Houghton & Co. Bulletin Ce-38.

Steel Data Sheets

Wheelock, Lovejoy & Co. gives analyses, physical properties, heat treating instructions, and applications of Hy-Ten, Economo, and S.A.E. alloy steels in concise and easily usable form. Bulletin Ox-74.

N-A-X

New twenty-page, fully illustrated booklet on N-A-X, high tensile low alloy steel has just been published by Great Lakes Steel Corporation. This steel has been thoroughly proved in application where ordinary high tensile steels have failed. Bulletin Kd-229.

Industrial Furnaces

Furnaces of all types are fully described in technical bulletins made available by the Eclipse Fuel Engineering Co. Bulletin Hc-226.

Metal Heating

Improvements in furnace economies, operating conditions and appearance, furnaces that will more satisfactorily meet old requirements or handle new processes, service that will help solve the most stubborn problems are offered and described by Mahr Mfg. Co. in Bulletin Ea-5.

Aircraft Heat Treating

A special bulletin, "Heat Treating Furnaces for the Aircraft Industry", has just been prepared by the Lindberg Engineering Co. Bulletin Nd-66.

Hi-Speed Furnace

An essential unit for general machine and tool shops is the Hi-Speed Steel Furnace described in literature by Johnson Gas Appliance Co. Bulletin Ae-298.

Heat Treating Furnaces

A brand new 16-page booklet of Holcroft & Company shows and describes their line of controlled atmosphere heat treating furnaces. Bulletin Ce-203.

Super Refractories

A catalog of Chas. Taylor Sons Co. is replete with useful data on P. B. Sillimanite refractories for use up to 3300° F. in electric furnace roofs and linings, induction furnaces, crucible furnaces, fuel-fired hearths, piers and linings, burner blocks, etc. Bulletin Ee-218.

Remote Transmission

Remote Transmission for indicating, recording and control of temperature, pressure, flow and liquid level in hazardous atmospheres where the use of electrical transmission is not desirable nor permissible is introduced in a new booklet by the Brown Instrument Co. Bulletin Ce-3.

Carburizing Boxes

Carburizing boxes that reduce heat treating costs and possess stubborn resistance against heat-corrosion and hard service are illustrated in a folder released by The Pressed Steel Co. Bulletin Ce-269.

Carburizer Cleaner

A machine for cleaning used carburizer so as to increase its life 50% is illustrated and described in a booklet by the Thurner Engineering Co. Bulletin Ae-300.

The Review
7301 Euclid Ave., Cleveland

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Two Members Tell of "Trouble Shooting" Jobs

Reported by J. W. McBean
Central Technical School

Ontario Chapter—A discussion of "Trouble Shooting" by two local members took place at the May 2nd meeting in Hamilton.

In the first part of the meeting R. C. Stewart of the Apco Petroleum Products, Toronto, took up the solution of many problems connected especially with heat treatment.

In one case small tools made from a steel which was usually satisfactory, turned out to be very brittle, and though hardening temperature was correct, the fracture was found to be very coarse.

Examination of the etched tools showed a massive cementite network, which had to be broken up by a preliminary higher heating and quenching in oil to normalize the steel before the final quenching.

0.040 In. Case Depth Sufficient

In using straight carbon steels for carburizing the usual case depth should be about 0.040 in. max., for even if actually carburized to a greater depth the steels are usually of such type as to be shallow hardening, and it is doubtful if the deep case would actually be hardened in its entirety.

Even here the wear tolerance usually permitted would be far less than 0.040 in. so additional depth would not materially affect life expectancy of the piece.

In the few instances where greater depth is desirable the base material should be a low carbon low alloy steel, such as S.A.E. 4615 or 2315. The effect of the alloy on transformation rates is such that any depth of case will harden throughout. An example of this type is armor plate.

In tensile tests on an interesting example of S.A.E. 2330 steel, circumferential cracks showed up. The core was normal; next to that a ring of decarburized material was shown, and the outer layer was fully carburized.

On examination of the original steel it was found to be excessively decarburized for some depth, and the salt bath used turned out to be carburizing to the steel.

Polarized Light Demonstrated

In the latter part of the evening A. A. Moline, of the Canadian Westinghouse Co., Hamilton, took up the principles involved in the use of polarized light for investigating stresses, and gave experimental demonstrations with a polaroid polarizer and polaroid analyzer.

With a great variety of models in celluloid the stresses were shown as they developed and changed in order of magnitude as indicated by alternating red and blue bands due to interference fringes.

Samples used included parts with sharp shoulders, and different forms of shoulders, with gradual bulges in diameter, with holes or slots in the specimens, and with small notches in the edge. One specimen was used to show all the variations till it gave way under tension.

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Leeds & Northrup instruments; controlling pyrometers, all makes; obsolete and defective parts considered; parts also. When appropriations are hard to get, use our offer for surplus and obsolete pyrometers to get new equipment.

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HERE AND THERE WITH A.S.M. MEMBERS



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A. F. Dohn

W. E. Griffiths

J. S. Marsh

TERMINATING an 11-year assignment as editor of the *Alloys of Iron Research* of the Engineering Foundation, FRANK T. SISCO has been appointed assistant secretary of the American Institute of Mining and Metallurgical Engineers and secretary of its Iron and Steel and Institute of Metals Divisions. He succeeds LOUIS JORDAN, who is now in the Government service in Washington.

Educated at University of Illinois, Mr. Sisco was chemist for Illinois Steel Co. from 1913 to 1915; chief chemist and superintendent, Hess Steel Corp., for the next four years; chemist at the U. S. Naval Ordnance plant in 1921; and engineer of tests, American Steel & Wire Co., 1922-23. From 1923 to 1929 he was research metallurgist and chief of the metallurgical laboratory at Wright Field in Dayton.

He was a national director of the A.S.M. in 1929, and is the author of four books in addition to the direction and editorship of the exhaustive and authoritative *Alloys of Iron Research* Monographs.

He has long been active in the A.I.M.E., having served as secretary and subsequently chairman of the Iron and Steel Division.

JOHAN S. MARSH, who has also been with the *Alloys of Iron Research* since its inception in 1930, and has been physical metallurgist and associate editor since 1933, is now promoted to editor, succeeding Mr. Sisco, and will be in charge of the work until its completion late in 1942.

Doing graduate work at Penn State heading toward a Ph.D., Marsh quit in 1927 to take a position with the Aluminum Co. of America. This was followed by a year with Keuffel and Esser Co. before joining the Engineering Foundation.

He is the author of three of the volumes in the *Alloys of Iron Series*.

ONE of the best known figures in the tool steel world has decided to call it a day. A. F. DOHN, formerly vice-president in charge of tool steel sales of the Allegheny Ludlum Steel Corp., has announced his retirement from active business interests.

Much to Allegheny Ludlum's gain, however, Mr. Dohn will continue in a consulting capacity as a vice-president of the company.

Mr. Dohn's tool steel experience covers the last three decades. After a stint with the Buffalo Engine Co. as sales manager and secretary-treasurer, he opened his own sales office in Buffalo in 1912. Three years later he joined the Atlas Steel Co., becoming vice-president in charge of sales in 1916 and president in 1924, and continuing in that capacity until 1929 when his company merged with the former Ludlum Steel Co.

For Ludlum, Mr. Dohn was vice-president in charge of sales until the Allegheny Ludlum merger in 1938,

when he assumed his recent status as vice-president in charge of tool steel sales with headquarters at the Watervliet, N. Y., plant.

ANEW development engineering department has been organized by Allegheny Ludlum Steel Corp., Pittsburgh, which is to be managed by W. E. GRIFFITHS.

A member of the A.S.M. since 1922, Mr. Griffiths' background in the alloy steel field well equips him for his new post. Starting 18 years ago as a metallurgist in the Union Carbide and Carbon Research Laboratories, he specialized in the stainless alloys, later holding responsible metallurgical positions with the Duralloy Co. and Central Alloy Division of Republic Steel.

During the eight years (1933-41) prior to his association with Allegheny Ludlum, Mr. Griffiths handled engineering and sales promotion of stainless and other alloys for Carnegie-Illinois in the midwestern states.

FRANCIS T. MCGUIRE, who has been teaching fellow in the Department of Metallurgy at the University of Notre Dame for the past two years, received the degree of Doctor of Philosophy at the June Commencement. Immediately thereafter he assumed his duties as assistant professor of metallurgy in the University of Kentucky at Lexington.

Mr. McGuire received his Bachelor's degree at Notre Dame in 1936 and his Master's degree in 1938. After spending one year in graduate work at Harvard University, he returned to Notre Dame to complete the work for his doctorate.

During the past year he has acted as reporter of Notre Dame Chapter meetings to THE REVIEW.

ANOTHER metallurgical addition to the OPM in Washington is E. J. HERGENROTHER, who has joined the staff of the Conservation Section, Production Division. He was formerly metallurgist in the Detroit Field Office of the Development and Research Division of the International Nickel Co., Inc.

A native of Indianapolis, Mr. Hergenrother was assistant chief metallurgist for Cadillac Motor Car Co. before joining International Nickel Co. He has been in the Detroit office for the past 12 years.

In the Office of Production Management his chief assignment is to encourage and assist industry to place into practice many of the suggestions made by an advisory committee of the National Academy of Sciences studying substitutes for scarce materials.

RUSSELL LOWREY, formerly metallurgist for the Hydril Co., who reports the meeting for the Los Angeles Chapter for THE REVIEW, is now metallurgist and plant manager for California Steel Treating Co., Los Angeles.

Principle of Thermocouple And Its Various Types Outlined for Syracuse

Reported by R. A. Shattuck

Inspector, Crucible Steel Co. of America

Syracuse Chapter—The fundamentals of temperature measurement and control for industrial purposes were explained by G. C. Graf of the Leeds and Northrup Co. in his lecture on "The Potentiometer" on April 2.

During the course of the talk it was pointed out that the principle of the thermocouple is derived from the fact that when two dissimilar metals or alloys are brought in contact with each other, an electromotive force is manifested. This force is amplified by the potentiometer and the temperature is read on a precalculated indicator.

Practically every thermocouple requirement can be served with one of the following combinations: Iron—constantan, chromel—alumel, copper—constantan, and platinum—platinum iridium or platinum rhodium.

In instances where thermocouples are unsatisfactory due to extreme elevated temperatures, position or movement of the work, instruments based on the reflection of radiant energy are used extensively. The chief requirements for this type are that the field of the instrument be covered completely by the work itself, and light obstructions such as smoke and flame be at a minimum.

Considerable discussion was held on the phenomenon of temperature lag in relation to work load and atmosphere variations.

Talks on Weldability Versus Hardenability

(Continued from page 1)

of the weld. Pearlite, on the other hand, is tough and, according to Mr. Aborn, makes a durable joint.

Multipass welding affords a means of improving some welds by recrystallizing columnar structure thereby eliminating the objectionable pattern. But to get an ideal weld with a maximum of ferrite-pearlite aggregate one must either change the S-curve or retard the cooling rate.

The welder can retard the cooling rate by increasing the ratio of heat input to heat dissipation through larger current, slower speed or by preheating. Since, in general, the tendency toward martensite increases with the increase in alloy and with the increase in carbon in low alloy, it is necessary to obtain a correspondingly slower cooling rate to force transformation to the tough constituent, pearlite.

It is no problem in the case of straight low carbon steels or mild steels with low manganese, for with these the maximum safe cooling rate is extremely high. But with steels like S.A.E. 4140, 4640, or 4340, the safe cooling rate is so low that preheating is a prerequisite to the welding operation in order to avoid martensite.

Molybdenum steels in the higher carbon ranges may be considered thus to have relatively difficult weldability. Intermediate are such steels as S.A.E. T1335, 2340, and 5140, indicating the desirability and often necessity of preheating.

Mr. Aborn summarized by observing that the four qualities of a good weld are: (a) Sound bond, (b) minimum distortion, (c) tough structure, (d) minimum internal stress.

The last quality may involve post-heating as well as preheating. The third quality, tough structure, involves adherence to Mr. Aborn's theme: "The objective of the welder is to obtain a structure free from martensite."

Trends in Copper And Its Alloys Cited By James T. Kemp

Reported by Fred P. Peters
Assistant Editor, Metals and Alloys

New Jersey Chapter—Our "second most important metal" and its alloys were kaleidoscopically presented at the April 21st meeting in Newark by James T. Kemp, metallurgical engineer of American Brass Co., Waterbury, Conn.

From the period of its earliest known use (circa 8000 B.C.) to the present day, copper has been man's standby—for a long time his most useful material. And although exceeded in world output and application in this era by iron and its alloys, copper has actually not regressed, for more of it is produced and used in modern times than ever before in the world's history.

Up to 1920 the United States was the greatest producer of raw copper, but today Africa is a larger source than America. The Canadian proportion of the world's total, on the other hand, has been mounting in recent years. This parallels a trend away from American production-volume leadership in certain other metals, such as lead and zinc.

War Will Stimulate Output

The ultimate effects of the present war on copper are not easy to predict. The output will, of course, be stimulated and much South American copper previously sent to Europe will be shipped to our shores. The price has been "steady" and up to recently the supply has been adequate, although this may be no longer true.

Of the total peace-time copper production, 65% is employed as the metal and 35% in alloyed form. The electrical industry takes 40% of the total, rod and wire for various purposes 13%, automobiles 11% (10% of the weight of an average auto is copper) and buildings 11%, to name the most important outlets.

Copper is surpassed in exposure durability among pure metals only by the precious metals, and it is second in conductivity. Its alloys are growing in

Ordnance Exhibited, Discussed at Boston



ABOVE: Lt. Col. J. S. Crawford (Cigar in Hand), Commanding Officer, Boston Ordnance District, and Lt. Col. L. A. Codd (Right), Executive Vice-President, Army Ordnance Association, Washington, D. C.,

Are Seen Discussing Ordnance Production With a Member of the Boston Chapter at the April Meeting. In rear Gen. R. W. Case, Commanding Officer of Watertown Arsenal, chats with Chapter Chairman Harrington.

BELOW: Educational Chairman Jim Baxter Shows Past Chairman Arden Knight How to Close the Breech on a 37-Mm. Gun at the Army Ordnance Association Exhibit.



Dues Waived for Soldiers

Attention of A.S.M. members is called again to a ruling of the Board of Trustees at its meeting last November. The Board at that time authorized the waiving of further payment of dues for members who have been inducted into military service up to the rank of commissioned officers.

number and in utility, with a wider range of compositions available in castings than in wrought products.

Induction Furnaces for Brass

Brasses are now made in induction or indirect arc type furnaces of up to 3000 lb. capacity. One type, the Ajax-Wyatt induction furnace, is used for 80% of the brass made in this country.

The average furnace heat is 600 lb., with a 600-lb. bar standard for brass sheet production. An 800-lb. cake is currently used in several brass mills.

Unquestionably, the most promising development in the field for copper alloys is in the heat treatable group such as copper-beryllium, copper-chromium, copper-nickel-silicon and copper-nickel-aluminum, although the standard brasses and bronzes will continue to account for the principal tonnage.

Attributes of Successful Research Director Given

Reported by R. A. Shattuck

Inspector, Crucible Steel Co. of America

Syracuse Chapter—Speaking on the "Principles of Metallurgical Research", Samuel L. Hoyt, technical advisor at Battelle Memorial Institute, outlined what, in his opinion, are the primary attributes of a successful research director. These are:

1. A natural intellectual curiosity.
2. A wide background of factual knowledge.
3. An awareness of industrial needs.
4. A sense of the practical importance of a field which is as yet undeveloped.

Dr. Hoyt stressed the importance of industrial sympathy toward research by illustrating that the great contributions in the development of metallurgy have not come from industry alone, but also from students and scientists such as Gibbs, whose phase rule revolutionized metallurgical study.

In the field of metal application, engineers and designers have had all too little in common with the metallurgists and a new science, arbitrarily called "metal mechanics", was proposed, bringing together the knowledge of these two groups.

The speaker stated that he felt this to be an excellent opportunity for in-

Catalog Radiographs To Check Failures

Reported by Francis T. McGuire

Teaching Fellow, University of Notre Dame

Notre Dame Chapter—Describing the use of radiography in the inspection of fabricated and welded members, H. H. Lester of Watertown Arsenal explained in detail a splendid system of cataloging the radiographs in order that subsequent failures may be checked.

It is possible to go back to files and pick out the radiograph of a particular portion of a welded member and examine the exact region of a weld failure.

The industrial importance of radiography is, however, as Dr. Lester has long maintained, in the development field. The first intricate casting or welded unit is not likely to be perfect.

Imperfections are examined by radiography and technique is changed until these imperfections disappear or are reduced to an insignificant minimum.

While pursuing this process or stage of development, the behavior and idiosyncrasies of a particular part are noticed. When finally a satisfactory technique is developed it is necessary to check only periodically in order to insure that there are no deviations from the established procedure.

Close collaboration between fabricator, inspector, and engineer is highly desired for the best interest of the finished article. The engineer knows the more highly stressed sections and the fabricator and inspector can with this knowledge more intelligently arrive at standards.

Industry to encourage this movement in order to be in a better position to meet the growing demands for safety and economy.

Hold Joint Meeting With Army Ordnance Asso.; Inspect Defense Material

Reported by R. G. Sault

Vice-President, Porter Forge & Furnace, Inc.

Boston Chapter—In the spirit of the times, on April 4 A.S.M. members joined with the Boston Post of the Army Ordnance Association to hold one of the most progressive meetings of the year.

A large number of companies cooperated in an exhibit of components of ordnance defense material which attracted considerable attention from the 450 members and guests, among whom were many of the commanding officers of the Navy Yard as well as the Watertown Arsenal.

After dinner Lt. Col. L. A. Codd, executive vice-president, Army Ordnance Association, Washington, D. C., spoke on "Armament the American Way". He was introduced by Lt. Col. C. S. Robinson, Ordnance Reserve, president of the Boston Post Army Ordnance Association.

Lt. Col. Codd stressed the fact that the Army and Navy are the greatest friends that industry has at the time in spreading out the \$40,000,000,000 worth of defense business now being created.

He also warned that talk would not hold back an invader but that adequate armament would safeguard this country possibly without firing a shot.

Work on Substitutes for Nickel Steels Outlined

Reported by R. E. Neils

Design Engineer, U. S. Forest Service

Oregon Chapter—Following a report by the nominating committee at the meeting on May 7, Honorable Earl Riley, mayor of Portland, was introduced and made a very timely talk on what Portland is doing to attract and promote defense industries.

Ray K. Bowden, manager of the metallurgical division of the Carnegie-Illinois Steel Corp., then spoke on the role of the metallurgist in the production and use of alloy steels, covering all the steps of manufacturing a product that will meet the user's requirements. Parts of the lecture were illustrated with lantern slides.

Chairman Healy then introduced John Mitchell of the Carnegie-Illinois Steel Corp., who, as chairman of the American Iron and Steel Institute Committee for studying substitutes for nickel-bearing steels, gave a résumé of what had been done along these lines.

A list of these substitutes for some of the S.A.E. nickel steels is being printed, which would show what steels are being replaced, together with the physical properties and heat treating recommendations.

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Positions Open

FOUNDRY METALLURGIST: Should be familiar with the metallurgical control of acid open-hearth and air furnace castings and heat treatment of iron and steel alloy castings. Good technical background, preferably a fairly recent college graduate, desired. Located in Ohio. Box 6-5.

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SALESMAN: Seamless tube mill; eastern territory. Must have technical training and steel product sales experience, preferably carbon and alloy tubing. Apply with full particulars to Box 6-25.

INSPECTORS: Naval Ordnance. Apply to Civil Service Commission at Washington, D. C., or to any first or second-class post office.

Positions Wanted

METALLURGIST: 33, married, M.S. in physical metallurgy. Eight years' research experience; aluminum, tin, copper, lead alloys. Developed new bearing alloy, lead-base die casting alloy, lead-base alloy for coating of steel. Experienced in metallography, X-ray technique, physical testing. Some patent experience, also Mechanical Engineer degree. Now employed by industrial research laboratory. Box 6-15.

HEAT TREAT FOREMAN: 25 years' practical experience in heat treating all grades of steel. At present employed. References. New England states preferred but not essential. Box 6-20.

METALLURGICAL ENGINEER: Master's degree; age 31. Six years chemical and metallurgical experience. Now employed as supervisor of heat treat department and plant metallurgist, also supervisor of chem. and met. lab. Box 6-30.

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